

ECE 302 Quiz 3  
(10 points)

Name: Solution (3 points)

07/11/2016

1. Let  $X$  be a uniform random variable on  $[-2,1]$ . Find the following expectations.  
Show all work.

(a) (1 point)  $\mathbb{E}[X]$

(b) (3 points)  $\mathbb{E}[2X^3 + 4X - 1]$

(c) (3 points)  $\mathbb{E}[X^3 | |X| > 1]$

$$f_x(x) = \begin{cases} 1/3 & , -2 \leq x \leq 1 \\ 0 & , \text{else} \end{cases}$$

$$(a) \mathbb{E}[X] = \frac{-2+1}{2} = \boxed{-1/2}, \text{ from notes}$$

$$(b) \mathbb{E}[2X^3 + 4X - 1] = 2 \mathbb{E}[X^3] + 4 \mathbb{E}[X] - 1$$

$$\mathbb{E}[X^3] = \int_{-2}^1 x^3 \cdot 1/3 dx = -5/4$$

$$\Rightarrow \mathbb{E}[2X^3 + 4X - 1] = 2 \cdot (-5/4) + 4 \cdot (-1/2) - 1 = \boxed{-11/2}$$

(c)

$$f_x(x | |X| > 1) = \frac{f_x(x) \mathbb{1}_{|x|>1}(x)}{\Pr(|X| > 1)} = \begin{cases} 1 & , -2 \leq x < -1 \\ 0 & , \text{else} \end{cases}$$

$$\Rightarrow \mathbb{E}[X^3 | |X| > 1] = \int_{-2}^{-1} x^3 dx = \boxed{-15/4}$$